Experience of Triage During an A/H1N1 Influenza Pandemic in After-Hours Emergency Centers

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Abstract

During the 2009 A/H1N1 influenza pandemic in Sendai, two primary emergency clinics, which are after-hours emergency centers managed by the Sendai Emergency Medical Service Foundation, were inundated with many influenza patients. In the course of the pandemic, from August 1, 2009 to March 31, 2010, a total of 47,831 internal medicine and pediatric patients visited the two clinics and rapid influenza tests were performed in 17,167 of patients, in which 6,697 patients tested A-positive. Consequently, 10,743 patients were diagnosed with influenza, which included 1,447 patients that tested negative, and 2,599 patients that were not tested.

Prior to the physicians check up, nurses performed triage and divided the patients into two groups, isolated and non-isolated. We examined the effect of triage, using the results of the rapid influenza test and antiviral drug administration, in each of the early, middle and maximum pandemic phases. Triage was considered effective in the early and middle phases, where the average number of influenza patients that visited the clinic per day were 21.4 and 50.6, respectively. But in the maximum phase where the average number of influenza patients soared to 275.3 per day, one out of three patients in the non-isolated group was clinically diagnosed as influenza. We were unable to separate influenza patients effectively in the maximum phase of pandemic.

Key words Influenza pandemic, After-hours emergency center, Rapid influenza test, Triage, Antiviral drug

Introduction

During the early phase of the 2009 A/H1N1 influenza pandemic, triage in terms of time and space was required in emergency medical settings.[1,2] In Japan, medical facilities that provide primary care for influenza are recommended to practice early diagnosis and early drug administration, in which rapid influenza test followed by antiviral administration has become an established practice.[3,4]

However, no detailed reports are to be found on the reality of triage carried out at emergency centers in the midst of the confusion of a pandemic, especially on the actual composition of the isolated and non-isolated groups divided by that triage.

The Sendai Emergency Medical Care Center and the Sendai-hokubu Emergency Medical Care Clinic, which are managed and run by the Sendai Emergency Medical Service Foundation, are after-hours (i.e. nighttime and holiday) emergency centers staffed by physicians on a rotating schedule. They are the cores of after-hours primary emergency care in Sendai city, Miyagi prefecture. During the influenza pandemic, nurses triaged patients based on medical interviews and divided them into isolated and non-isolated groups. We validated the realities and effects of triage conducted during the pandemic by preparing individual patient slips as indicators of rapid influenza testing and antiviral administration.

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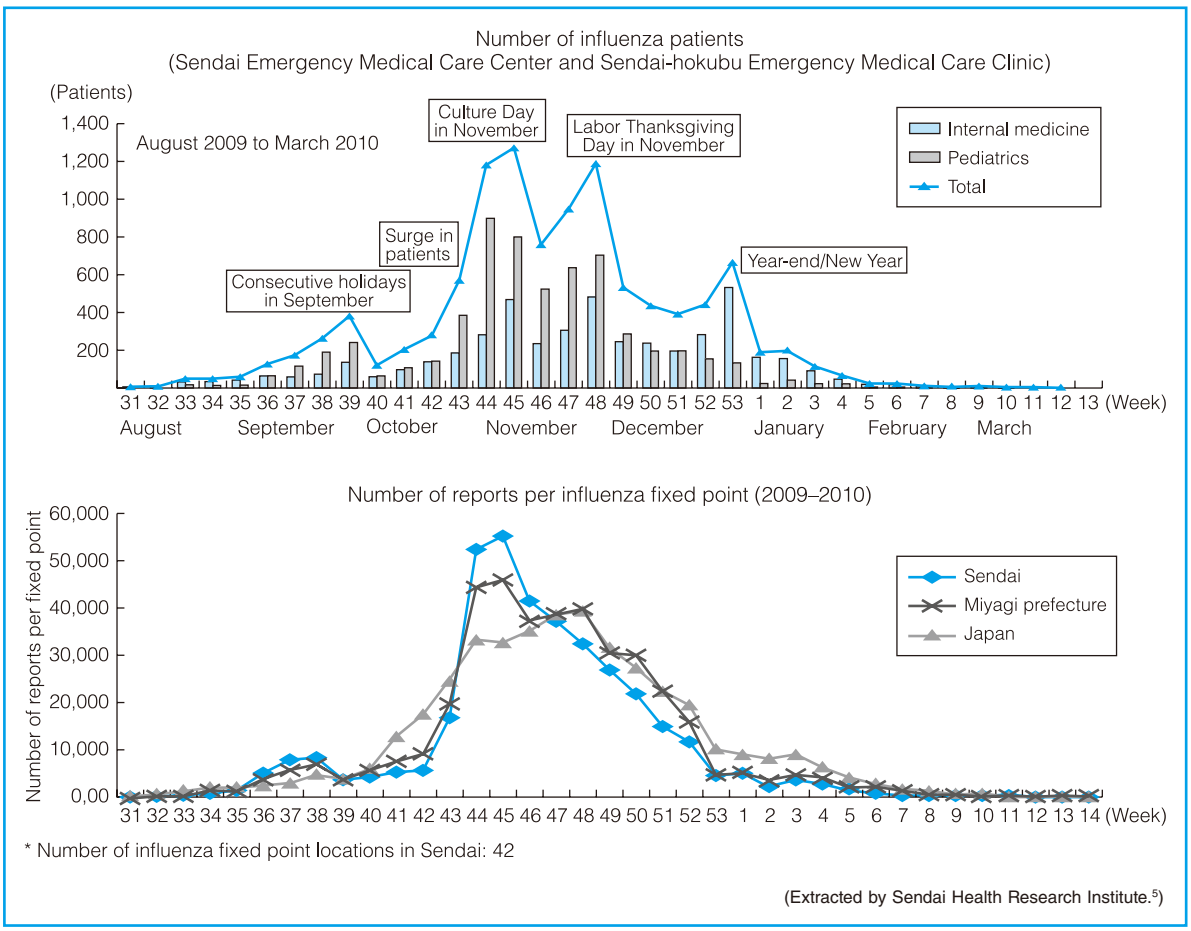


Fig. 1 The transition in the number of influenza patients over time

Scope and Methods

The transition in the number of influenza patients over time (weekly) in the Sendai Emergency Medical Care Center and the Sendai-hokubu Emergency Medical Care Clinic is shown in **Fig. 1** (top).

The present study focused on the Sendai Emergency Medical Care Center, where it was possible to increase the number of physicians and nurses staffing the center during the pandemic. The usual hours for physicians at the Sendai Emergency Medical Care Center are one internist and one pediatrician on Saturday afternoons, Sunday and holiday daytime, evening and nighttime (all day) with two internists during the evening shift on Sundays and holidays. From the long holiday week of September 19 to 23, 2009 until the end of the year, two internists and two pediatricians as well as more nurses were put on duty during the daytime and evenings on Sundays and holidays.

We extracted the patients seen on consecutive holidays in September, when the number of patients increased considerably compared to weekdays and the staff was strengthened with more physicians and nurses. We then compared the isolated groups and non-isolated groups for the 1,554 patients seen during the early phase (eight days from mid-August to mid-September), the 1,931 patients seen during the middle phase (seven days including consecutive holidays in September), and the 1,420 patients seen during the peak phase (three days including Labor Thanksgiving Day in November), combining internal medicine and pediatric patients (**Table 1**).

Table 1 Consideration of interview-based triage (Sendai Emergency Medical Care Center)

Pandemic period	All overall					Triaged patients		
	Total patients	Rapid tests	Positive	Total influenza patients	Total non-influenza patients	Isolated	Non-isolated	Percent isolated
Early phase	1,554	547	147	171	1,383	125	1,429	8.0%
Middle phase	1,931	682	184	354	1,577	329	1,602	17.0%
Peak phase	1,420	780	474	826	594	604	816	42.5%

Pandemic period	Isolated patients administered antiviral				Non-isolated patients administered antiviral			
	Positive	Negative	Untested	Influenza patients	Positive	Negative	Untested	Influenza patients
Early phase	97	7	14	118	50	3	0	53
Middle phase	137	50	92	279	47	9	19	75
Peak phase	306	35	228	569	168	37	52	257

Pandemic period	Weekend and holiday days extracted	Influenza patients per day
Early phase	Eight days from mid-August to mid-September	21.4+15.9
Middle phase	Seven days including consecutive holidays in September	50.6+22.2
Peak phase	Three days including Labor Thanksgiving Day in November	275.3+71.5

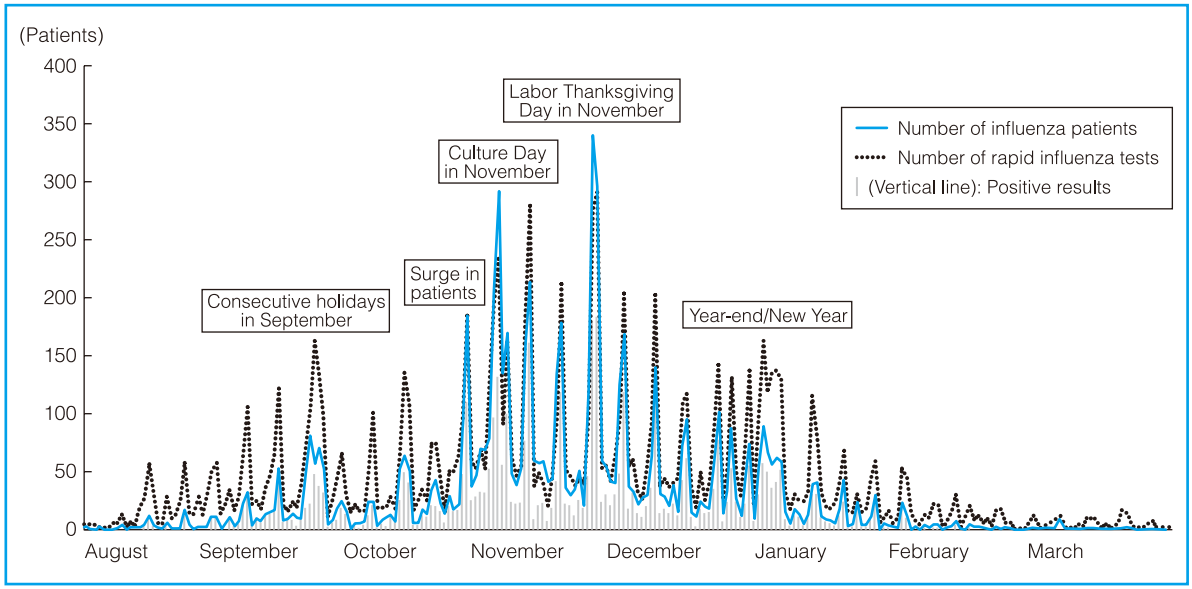
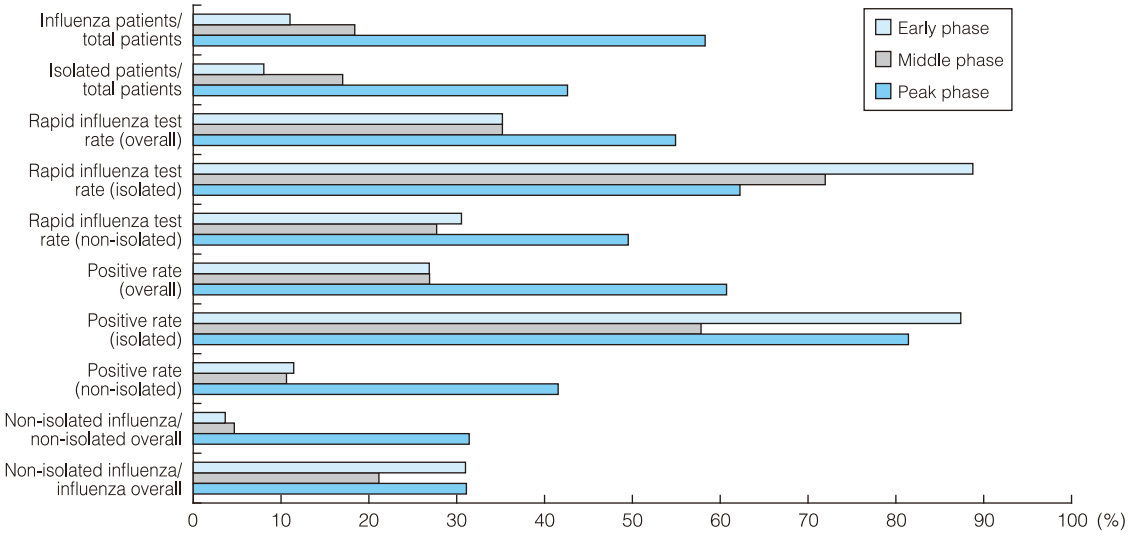


Fig. 2 The transition in the number of patients given a rapid influenza test (daily basis: August 1, 2009 to March 31, 2010, Sendai Emergency Medical Care Center)

The diagnosis of influenza infection was taken to be a positive (A+) or negative (A−) result on the rapid influenza test for patients with clinical symptoms as well as patients administered an antiviral based on the attending physician's clinical diagnosis for patients who were untested



Pandemic phase	Influenza patients/ total patients	Isolated patients/ total patients	Rapid influenza test rate			Rapid influenza test positive rate			Non-isolated influenza/ non-isolated overall	Non-isolated influenza/ influenza overall
			(overall)	(isolated)	(non-isolated)	(overall)	(isolated)	(non-isolated)		
Early phase	11.0%	8.0%	35.2%	88.8%	30.5%	26.9%	87.4%	11.5%	3.7%	31.0%
Middle phase	18.3%	17.0%	35.3%	72.0%	27.8%	27.0%	57.8%	10.6%	4.7%	21.2%
Peak phase	58.2%	42.5%	54.9%	62.3%	49.5%	60.8%	81.4%	41.6%	31.5%	31.1%

Fig. 3 Results of interview-based triage

but who had contact with an influenza patient or who had a group infection around them.

Prior to a physician's diagnosis, patients were given a medical interview by a nurse, who triaged them into an isolated group or non-isolated group based on the presence of clinical symptoms (fever, coughing, myalgia, sore throat, etc.), contact with an influenza patient, and the existence of a group infection around the patient. Individual patient slips recording information including whether the patient was isolated, the result of a rapid influenza test (positive, negative, or untested), and the administration of an antiviral (oseltamivir or zanamivir) were prepared. With these we studied what was actually done in medical care and triage at an emergency clinic.

Results

Rapid influenza test and diagnosis during the A/H1N1 influenza pandemic

Rapid influenza tests were given to 17,167 out of the 47,831 internal medicine and pediatric patients (35.9%) who visited the Sendai Emergency Medical Care Center and the Sendai-hokubu Emergency Medical Care Clinic from August 2009 to March 2010. The number of cases diagnosed as the influenza by the physicians was 6,697 patients who received a positive result on the rapid influenza test (39.0% of all patients who were give a test), 1,447 patients who were administered an antiviral with a negative result on the rapid influenza test (13.8% of the negative results on the test), and 2,599 patients who were untested but administered an antiviral, making a total of 10,743 patients.

Number of patients and the rapid influenza test

Figure 2 shows the daily results for rapid influenza tests and the transition in the number of patients diagnosed with influenza in the Sendai Emergency Medical Care Center. The percentage of positive results on the test was 27% during the early and middle phases of the pandemic and rose to 60.8% during the peak phase (**Fig. 3**).

During the early phase of the pandemic and also from January 2010 forward, when there were relatively few influenza patients, antivirals were administered mainly in cases of a positive result on the test. During the middle and peak phases of the pandemic, however, physicians administered antivirals based on clinical diagnoses to many untested patients and patients with negative results (**Table 1**).

Results of interview-based triage (**Fig. 3**)

We compared the results of the interview-based triage in terms of the phase of the pandemic (early, middle, and peak phases) and other respects.

Table 1 shows the total number of patients (internal medicine and pediatric) seen during the pandemic, the number of patients given a rapid influenza test, the number of positive results on the rapid influenza test, and other data. The average number of influenza patients per day during each phase was 21.4 ± 15.9 in the early phase, 50.6 ± 22.2 in the middle phase, and 275.3 ± 71.5 in the peak phase (**Table 1**, bottom).

Influenza patients/total patients

The percentage of patients ultimately diagnosed with influenza out of the total number of patients (internal medicine and pediatric) rose from 11.0% in the early phase to 18.3% in the middle phase, and then to 58.2% in the peak phase, eventually increasing to over half the total number of patients.

Isolated group/total patients

The percentage of patients isolated out of the total number of patients (internal medicine and pediatric) was 8.0% in the early phase, 17.0% in the middle phase, and 42.5% in the peak phase.

Rapid influenza testing rates (total, isolated, non-isolated)

A high percentage of patients in the isolated group were given a rapid influenza test: 88.8% in the early phase, 72.0% in the middle phase, and 62.3% in the peak phase. Many patients in the non-isolated group were also given a rapid influenza test: 30.5% in the early phase, 27.8% in the middle phase, and 49.5% in the peak phase.

Rates of positive rapid influenza tests (total, isolated, non-isolated)

The overall rates of positive rapid influenza tests were 26.9% in the early phase, 27.0% in the middle phase, and 60.8% in the peak phase. The isolated group showed extremely high positive rates: 87.4% in the early phase, 57.8% in the middle phase, and 81.4% in the peak phase. In the non-isolated group on the other hand, the rates were clearly low compared to the isolated group: 11.5% in the early phase, 10.6% in the middle phase, and 41.6% in the peak phase. The difference was especially noticeable in the early and middle phases.

Non-isolated influenza patients in non-isolated patients overall

The percentage of influenza patients ending up being seen in the non-isolated group, out of the total number of non-isolated patients, was 3.7% in the early phase, 4.7% in the middle phase, and 31.5% in the peak phase.

Non-isolated influenza patients in total influenza patients

The percentage of influenza patients seen in the non-isolated group, out of the total number of influenza patients in each phase of the pandemic, was 31.0% in the early phase, 21.2% in the middle phase, and 31.1% in the peak phase. Thus, in all phases, 20–30% of the total number of influenza patients were seen in the non-isolated group.

Discussion

The total number of patients seen in an average year at the Sendai Emergency Medical Care Center and the Sendai-hokubu Emergency Medical Care Clinic is over 70,000. Both facilities are after-hours (nighttime and holiday) emergency centers staffed by physicians, nurses, and other personnel basically working part-time on a rotating schedule. In preparation for the busy time from consecutive holidays in September onward, a temporary increase in healthcare professionals including physicians, nurses, pharmacists, and others was made to handle the increase in patients, but it was anticipated that securing voluntary manpower due to an increase in on-duty times and sickness among healthcare professionals would become difficult if the pandemic became protracted.

At the height of the pandemic, many influenza patients—ranging from half to the same number of patients in the Sendai Influenza Fixed Point Report[6] (weekly, 42 fixed locations) converged on our two facilities (**Fig. 1**). Physicians who see influenza patients on a routine basis and are familiar with its clinical characteristics know well from experience that it is very difficult to entirely isolate patients into so called "fever

clinic" (a special outpatient unit designed to isolate patients with fever from other patients) during an epidemic.[7] All medical institutions need to take A/H1N1 countermeasures and handle outbreaks according to their role.[3]

In Sendai, the outbreak started from the end of October 2009 and the number of patients peaked within a week or two (**Fig. 1**). Advance preparations based on forecasts are essential, and the precautions taken by the Sendai Medical Network Council, which included experts, worked effectively. A mere two weeks after the WHO declared on April 29, 2009 that the pandemic had entered Phase 5, 329 private practice clinics in Sendai had committed to seeing influenza patients.[8,9] The overconcentration of influenza patients in Sendai was mitigated by the city's nation-leading initiative, but it was not possible to avoid the concentration of patients at emergency centers after hours.

During the early and middle phases, when the number of influenza patients averaged 21.4 to 50.6 per day, the percentage of those ending up in the non-isolated group was only 3.7% in the early phase and 4.7% in the middle phase, by which triage can be judged to have been effective. However, during the peak phase when the number of influenza patients increased to an average of 275.3 per day, as many as 31.5% of them were mixed up in the non-isolated group, indicating that patients could not be effectively separated even when triaged.

Everyone in the isolated group has influenza-like symptoms such as fever, and especially during the peak phase contained a very high percentage of positive results on the rapid influenza test (81.4%). Untested patients in the isolated group were diagnosed clinically as influenza cases, without performing a rapid influenza test, based on findings such as clinical symptoms, group infection around the patient, and infection within the family. Excluding patients who did not wish to be administered an antiviral, patients who were not prescribed an antiviral by the attending physician based on the patient's condition, and the few patients who were thought to be non-influenza cases, antiviral drugs were administered to the vast majority (91.3%) of patients in the isolated group.

In addition to internal medicine, pediatrics, and surgery, on Sundays and holidays the Sendai Emergency Medical Care Center also provides medical care by specialists in orthopedics, otorhinolaryngology, and obstetrics/gynecology (for a total of seven departments). During this influenza pandemic, even during the peak phase, the number of influenza patients seen on Sundays and holidays was about half the number of patients seen in all seven departments combined. Although it is possible to isolate many influenza patients using interview-based triage, it seems difficult to effectively prevent infection between patients when they concentrate in emergency clinics beyond those clinics' capacity.

Making a simple calculation assuming that the office hours for ordinary medical institutions are 9:00–17:00 on weekdays and 9:00–13:00 on Saturdays, they are open for no more than about 25% of the 8,760 hours in a year. The remaining 75% (what is called "after-hours") ends up being covered by medical institutions that provide emergency care and by nighttime and holiday clinics. The question of how to mitigate the concentration of patients at after-hours emergency centers, as happened during this pandemic, is an extremely important issue as a measure to prevent the failure of roles as an emergency clinic which has to handle primary care on the front lines at the height of a pandemic.

The National Pandemic Flu Service established in conjunction with this pandemic by the UK's National Health Service (NHS) could serve as a useful reference.[10] The service began on July 23, 2009 and was closed on February 11, 2010, when the pandemic came to a conclusion. The system enabled patients to obtain antivirals under certain conditions without being seen at a medical institution. It has been reported that over 2.73 million people checked symptoms using the Internet and a special phone line, that 1.81 million were given a registration number, and that 1.16 million received antivirals.[11] In this case, the person going to pick up the antivirals was not the patient but a family member or friend called a "flu friend."

Untested patients put in the isolated group by the interview-based triage that we conducted were patients who could be diagnosed clinically without performing a rapid influenza test. During the height of a pandemic, we believe there should be a policy that allows physicians to prescribe antivirals without in-person examinations if previsit telephone consultations found them to be free of severe symptoms or risk factors. We hope

the government and academic societies to examine the rationality and safety of such emergency policy only as a last report during a pandemic.

Conclusion

We reported one part of the situation and reality at after-hours emergency centers that provided medical care on the frontline in the treatment of A/H1N1 influenza. Interview-based triage worked well during the early and middle phases but it was not possible to separate patients effectively during the peak phase. When the national and local governments put together countermeasures against a second wave or avian influenza in the future, we hope that they will make use of our experience and devise measures that meet the needs on the ground in more detail at after-hours emergency centers and other facilities that have to handle an important part of primary care.

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